Perceived Environments Impact on Exercise Using Virtual Reality

Quarantine Edition
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Background

- Using Virtual Reality (VR) during exercise has been shown to have a positive impact
  - Overall performance
  - Endurance
  - Motivation
  - Some evidence of decreases in RPE\(^1\)

- Previous research has focused on VR effects during aerobic exercise
  - Some research on resistance exercise VR in clinical therapy setting
  - Limited research on VR effects on performance during resistance training for healthy individuals
Original Plan

● “What effects do motivational and environmental cues have on an individual’s performance?”

● Cycle ergometer
  ○ watts and distance

● 5-10 minute trials
  ○ Baseline
  ○ VR Headset
    ■ Relaxing and action/fast bike scenes in 360-degree motion
  ○ Audio cues
    ■ positive or negative encouragement

● Perceived motivation (1-10 scale), RPE (6-20 scale)
Research Question

Does the environment perceived by the individual have an effect on the number of bicep curls completed?
## Subject Information:

<table>
<thead>
<tr>
<th></th>
<th>Age (years)</th>
<th>Weight (lbs)</th>
<th>Curling Weight (lbs)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Male  (n=4)</td>
<td>20.5</td>
<td>191.25</td>
<td>15</td>
</tr>
<tr>
<td>Female (n=6)</td>
<td>22</td>
<td>138.67</td>
<td>10</td>
</tr>
</tbody>
</table>
Methods

Baseline Trial:

- Resting heart rate (HR) was taken
- Subject was instructed to perform as many bicep curls as possible
  - Trial was timed, number of reps were recorded
  - Started with dominant hand
  - Weight: 10lbs Females, 15lbs Males
- Immediately after trial HR was recorded
- Motivation level on a scale of 1-10 and RPE were recorded
- Subject rested for at least 1.5 minutes or until HR was within 5 bpm of the original RHR
- Repeat with non-dominant hand with the same components recorded
# Rate of Perceived Exertion (RPE) Scale

<table>
<thead>
<tr>
<th>BORG RPE</th>
<th>MODIFIED RPE</th>
<th>BREATHING</th>
<th>TRAINING ZONE</th>
<th>% of MHR*</th>
<th>EXERCISE TYPE</th>
</tr>
</thead>
<tbody>
<tr>
<td>6</td>
<td>0</td>
<td>No Exertion</td>
<td>1</td>
<td>50%-60%</td>
<td>Warm up</td>
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<tr>
<td>7</td>
<td></td>
<td>Very Light</td>
<td></td>
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<tr>
<td>8</td>
<td>1</td>
<td>Deeper but comfortable breathing. Able to hold a conversation.</td>
<td>2</td>
<td>60%-70%</td>
<td>Recovery</td>
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<tr>
<td>10</td>
<td>2</td>
<td>Aware that breathing is harder; able to talk but difficult to hold conversation</td>
<td>3</td>
<td>70%-80%</td>
<td>Aerobic</td>
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<tr>
<td>11</td>
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</tr>
<tr>
<td>12</td>
<td>3</td>
<td>Starting to breathe hard and getting uncomfortable</td>
<td>4</td>
<td>80%-90%</td>
<td>Anaerobic</td>
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<td>13</td>
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</tr>
<tr>
<td>14</td>
<td>4</td>
<td>Deep and forceful breathing. Uncomfortable and not wanting to talk</td>
<td>5</td>
<td>90-100%</td>
<td>VO^2 Max</td>
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<tr>
<td>15</td>
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<td>16</td>
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<tr>
<td>19</td>
<td>9</td>
<td></td>
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<td></td>
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</tr>
<tr>
<td>20</td>
<td>10</td>
<td>Maximum exertion</td>
<td></td>
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</tbody>
</table>
Do as many curls as possible with dominant hand

- Females: 10lb Dumbell
- Males: 15lb dumbell

Start Trial
- Record number of Reps
- Record Time

Record Data
- # of reps
- Time
- RPE
- HR
- Motivation

Rest 1.5 minutes or until HR was within 5 bpm of resting HR

Repeat W/ Non-Dominant Hand

Repeat at 48 hours under new condition
Methods cont.

- **3 environmental conditions:**
  - None: baseline
  - Action: Marvel’s Captain America: Civil War
  - Relaxing: National Geographic’s Lions

- **Qualitative Data Collection**
  - Do you prefer to listen to music while working out?
  - Do you watch anything while working out?
Relaxing VR Scene:
National Geographic’s Lions
Action VR Scene: Marvel’s Captain America: Civil War
Data - Repetitions ND and D arm

* - comparing baseline v action
* - comparing action v relaxing
Data - Motivation

* Males versus females action = $p < 0.05$
* Males relaxing versus baseline = $p < 0.05$
Data - Motivation vs. Reps
Results

- The action scene resulted in more repetitions completed than baseline and relaxing scenes when comparing same arm
- Significant increase in motivation between men and women when action scene is perceived, regardless of arm used
- Significant difference for all subjects in baseline vs. action (↑) and action vs. relaxing (↑)
  - No significance for baseline vs. relaxing (═)
- Significant difference for males only in baseline vs. action (↑), baseline vs. relaxing (↑), action vs. relaxing (↓)
- Significant difference for females only in baseline vs. action (↑) and action vs. relaxing (↓)
  - No significance for baseline vs. relaxing (═)
Group Discussion

● Subjects asked if they preferred to listen to music while working out
  ○ Everyone answered yes

● Subjects asked if anyone had watched something, either on television or their phones.
  ○ Most subjects said they watch whatever is on the TV at the gym

● Subject 1: “I watch a show on Netflix while I bike, but not something I have to pay really close attention to.”

● Subject 8: “I only listen to music while I lift but I watch sports on the TVs while I run.”
Conclusion

- Action creates a difference
- Relaxation didn’t create a difference
- Use of VR may be dependent on the specific scenes involved
- Limitations...
  - Limited exercise opportunities because of goggles
  - Small population size - could’ve made some things that weren’t significantly different. For example dominant arm non significance.
- Future
  - See the role of personality
  - Using different weights for different body weights
References


https://www.youtube.com/watch?v=zcbec9QxBjA

https://www.youtube.com/watch?v=sPyAQQklc1s